

Sixty-nine presents were announced as having been received since the last meeting, including, amongst others :—

G. Bigourdan, *Les Eclipses de Soleil : instructions sommaires sur les observations que l'on peut faire pendant les éclipses*, presented by the Author ; map of England showing track of total solar eclipse of 1927, presented by Rev. S. J. Johnson.

On Hansen's Coefficients for the Inequalities in the Moon's Longitude. By E. Nevill.

As I have already stated on several occasions during the last ten years, my own calculations have sufficed to confirm the accuracy of the values given by Hansen in the *Darlegung* for the coefficients of the inequalities in the expression for the Moon's longitude derived from the direct perturbing action of the Sun, the difference being seldom more than a few hundredths of a second of arc.

This statement has now been confirmed by the still more complete calculations of Professor Brown (*Monthly Notices*, vol. lxv. p. 276) ; and it follows that the theoretical expression for the disturbing action of the Sun on the normal elliptic motion of the Moon must be held to have been determined with all requisite accuracy.

The differences between the tabular and theoretical values of the coefficients are not sufficient to produce any important discrepancy between the tabular and observed places, as they will seldom much exceed a second of arc, and be in general much smaller.

Hence the existing large discordances between the tabular and observed places of the Moon must be ascribed to some different origin—to the effect of the perturbations of the planets, the figure of the Earth, or some similar cause.

This result is most important, for it clears the field.

For the sake of comparison I give the results that I have derived, reduced with values of the constants which differ but very slightly from those made use of by Newcomb in his transformation of Hansen's theoretical values. They are the results which have been adopted in my investigation of the errors of Hansen's tables now awaiting printing.

They have been compared with :

1. Hansen's theory.
2. Hansen's tables.
3. Brown's theory as brought up to Hansen's data = B + R.

The notation is Hansen's : the smaller terms have been generally omitted, and the values carried only to two places of decimals.

Argument.	Coefficient.	Correction to reduce to the values of Hansen's Theory.	Hansen's Tables.	Brown's Theory.
g	+ 22640.15	+ 00.00	+ 50	+ 00.00
$2g$	+ 769.06	+ 00.00	- 60	+ 00.00
$3g$	+ 36.13	+ 00.00	- 10	- 10
$4g$	+ 1.94	+ 00.00	- 10	+ 00.00
$-3g - g'$	+ .55	+ 00.00	- 00	+ 00.00
$-2g - g'$	+ 7.67	+ 00.00	- 10	+ 00.00
$-g - g'$	+ 109.88	+ 04.00	+ 70	+ 90.00
$-g'$	+ 669.85	+ 00.00	+ 91	- 01.00
$g - g'$	+ 148.28	- 26*	- 25	- 22
$2g - g'$	+ 9.72	+ 00.00	+ 00	+ 10.00
$3g - g'$	+ .67	+ 00.00	+ 00	+ 10.00
$-g - 2g'$	+ 1.1	+ 10.00	+ 10	+ 00.00
$-2g'$	+ 7.50	+ 10.00	+ 20	+ 30.00
$g - 2g'$	+ 2.58	+ 10.00	- 10	+ 20.00
$2g - 2g'$	+ .61	+ 00.00	+ 00	+ 10.00
$-3g'$	+ .01	- 20.00	- 10	+ 00.00
$g - 3g'$	+ .06	- 10.00	+ 00	- 10.00
$+2\omega - 2\omega'$	- .22	- 10.00	- 70	- 40.00
g	- 2.50	- 40.00	+ 20	- 50.00
$2g$	- 1.8	- 10.00	- 10	- 10.00
$-g - g'$	+ 1.12	+ 90.00	+ 00	+ 90.00
$-g'$	+ 2.40	+ 12.00	+ 15	+ 01.00
$g - g'$	- 28.25	- 31*	- 34	- 29
$2g - g'$	- 24.45	+ 00.00	+ 00	- 03.00
$3g - g'$	- 2.95	+ 02.00	+ 03	+ 02.00
$4g - g'$	- .29	+ 00.00	+ 00	+ 00.00
$-2g - 2g'$	+ .97	- 02.00	- 02	- 02.00
$-g - 2g'$	+ 13.22	- 03.00	- 02	- 03.00
$-2g'$	+ 211.74	- 03.00	- 05	- 70.00
$g - 2g'$	+ 4586.66	- 01*	+ 02	- 11.00
$2g - 2g'$	+ 2369.74	+ 10.00	+ 39	+ 91.00
$3g - 2g'$	+ 19.96	- 10.00	- 10	- 10.00
$4g - 2g'$	+ 14.39	- 10.00	- 02	+ 00.00
$5g - 2g'$	+ 1.06	+ 00.00	+ 00	+ 00.00
$-g - 3g'$	+ .49	- 10.00	- 04	- 10.00
$-3g'$	+ 8.66	+ 00.00	+ 03	- 10.00
$g - 3g'$	+ 206.30	+ 19.00	+ 81	+ 19.00
$2g - 3g'$	+ 165.54	+ 02.00	+ 10	+ 10.00
$3g - 3g'$	+ 19.41	- 10.00	+ 00	+ 10.00

Argument.	Coefficient.	Hansen's Theory.	Hansen's Tables.	values of Brown's Theory.
$4g - 3g'$	+	18.18	+00.00	+00.00
$-4g'$	+	.28	+00.00	+00.02
$g - 4g'$	+	7.46	-00.02	-00.05
$2g - 4g'$	+	8.12	+00.01	+00.02
$3g - 4g'$	+	.74	+00.02	+00.02
$g - 5g'$	+	.25	+00.01	+00.00
$2g - 5g'$	+	.32	+00.02	+00.03
$g - 3g' + 4\omega - 4\omega'$	+	.02	+00.02	+00.00
$2g - 3g'$	-	.51	+15.15*	+5.15
$3g - 3g'$	-	.69	+05.05	+05.05
$4g - 3g'$	-	.29	+00.00	+00.00
$g - 4g'$	+	11.15	+00.03	+00.04
$2g - 4g'$	+	30.77	+00.10	+00.00
$3g - 4g'$	+	38.45	-00.02	-00.02
$4g - 4g'$	+	13.94	-00.04	-00.04
$5g - 4g'$	+	1.95	+00.03	+00.03
$g - 5g'$	+	.07	+00.00	+00.00
$2g - 5g'$	+	2.75	+00.00	+00.00
$3g - 5g'$	+	4.35	+00.05*	+00.05
$4g - 5g'$	+	1.79	+00.01*	+00.01
$5g - 5g'$	+	.26	+00.03	+00.02
$2g - 6g'$	+	1.13	+00.03	+00.03
$3g - 6g'$	+	.30	+00.10	+00.10
$4g - 6g'$	+	11.14	+00.10	+00.10
$3g - 6g' + 6\omega - 6\omega'$	+	.28	+00.10	+00.02
$4g - 6g'$	+	.55	+00.02	+00.02
$5g - 6g'$	+	.37	+00.03	+00.02
$6g - 6g'$	+	1.13	+00.00	+00.00
$g' + 2\omega$	+	10.01	+00.00	+00.00
$g + g'$	-	.09	+00.00	+00.00
$2g + g'$	+	.42	+00.00	+00.00
$-g$	+	.06	+00.00	+00.00
$+2\omega$	+	11.30	-21.70	+00.00
g	-	39.50	-08.70	+00.23
$2g$	-	411.63	+03.21	-00.90
$3g$	-	45.01	-00.00	-00.00
$4g$	-	4.10	+00.10	+00.10
$5g$	-	.33	+00.00	+00.00

Argument.	Coefficient.		Correction to reduce to the values of Hansen's Theory.	Hansen's Tables.	Brown's Theory.
$-g' + 2\omega$	+	.10	+.06	-.02	+.02
$g - g'$	+	.01	-.02	-.02	-.02
$2g - g'$	-	.08	+.00	.00	.00
$3g - g'$	-	.30	+.00	.00	.00
$-g + 3g' + 2\omega'$	+	.37	+.03	-.03	.00
$+3g'$	-	.21	+.10	-.10	.00
$g + 3g'$	+	.05	-.10	.00	.00
$-2g + 2g'$	+	.44	-.10	-.02	.02
$-g + 2g'$	+	6.37	-.10	+.05	.00
$+2g'$	-	55.28	+.03	+.30	.01
$+g + 2g'$	-	.15	-.03	.00	.00
$+2g + 2g'$	+	.56	+.00	.00	.00
$-g + g'$	-	.08	+.00	.00	.00
$+g'$	+	1.50	+.05†	.00	.90
$2g - 2g' + 4\omega - 2\omega'$	-	.53	-.10	.00	.10
$3g - 2g'$	-	9.37	+.00	.00	.00
$4g - 2g'$	-	5.74	+.00	-.10	.00
$5g - 2g'$	-	1.00	+.10	-.10	.10
$6g - 2g'$	-	.12	+.00	.00	.00
$3g - 3g'$	-	.43	+.00	-.04	.00
$4g - 3g'$	-	.38	+.00	.00	.00
$5g - 3g'$	-	.07	-.10	.00	.10
$g - 4g' + 2\omega - 4\omega'$	+	.25	-.03	-.10	.00
$2g - 4g'$	+	.00	+.00	+.02	.03
$3g - 4g'$	-	.04	-.10	+.02	.10
$4g - 4g' + 6\omega - 4\omega'$	-	.15	-.02	+.00	...
$5g - 4g'$	-	.19	-.10	-.10	.02
$6g - 4g'$	-	.18	+.09†	+.09	-.02
$3g + 4\omega$	+	.08	+.00	.00	.00
$4g - 4\omega$	+	.42	+.00	.00	.00
$5g$	+	.09	+.00	.00	.00
$-g + \omega - \omega'$	+	.35	+.03	+.02	.00
$+ \omega - \omega'$	+	1.18	+.15†	+.41	.80
$+g$	+	18.08	+.10	+.07	.07
$2g$	+	1.25	+.02	+.03	.03
$-g - g'$	-	1.75	-.03	-.04	.00
$-g'$	-	18.73	+.03	-.42	.04
$g - g'$	-	125.90	+.47†	-.54	.15

Argument.	Coefficient.	Hansen's Theory.	Hansen's Tables.	Brown's Theory.
$2g - g'$	—	8°.52	—°.04	—°.02
$3g - g'$	—	.59	.00.+	.00.+
$-2g'$	—	.15	.00.—	.00.—
$g - 2g'$	—	.59	.10.—	.03
$2g - 2g'$	—	.12	.10.—	.00.+
$g - 2g' + 3\omega - 3\omega'$	—	.03	.10.—	.10.—
$2g - 2g'$	+	.28	.00.+	.00.+
$3g - 2g'$	+	.15	.00.+	.00.+
$g - 3g'$	—	1.23	.10.+	.00.+
$2g - 3g'$	—	3.16	—.07*	.07
$3g - 3g'$	+	.47	—.06*	.07
$g - 4g'$	—	.08	.00.+	.00.+
$2g - 4g'$	—	.22	.10.—	.10.—
$3g - 4g'$	+	.08	.10.—	.10.—
$2g - g' + 3\omega - \omega'$	+	.02	.00.+	.00.+
$3g - g'$	+	.24	.00.1	.00.+
$4g - g'$	+	.04	.00.0	.00.+
$g - 3g' + \omega - 3\omega'$	—	.30	—.02	.05
$g' + \omega + \omega'$	+	.06	.00.2	.02
$g + g'$	+	.58	.00.3	.00.+
g	+	.05	.10.—	.04.—

Differences of $\pm 0''$.01 or even of $\pm 0''$.02 mean little, as the greater part of their magnitude arises in the contraction from three to two places of decimals.

In seventeen cases where my own results differ sensibly from those found by Hansen from his last theoretical calculation, in eleven cases marked by an asterisk (*) Hansen's values are confirmed by Professor Brown, showing that in these instances my own approximations have not been carried sufficiently far or some combination of several terms has been overlooked; and in six cases marked with a dagger (†) my own results are confirmed by Professor Brown.

The details of the calculation of my own results are intended to form the third volume of the work on the lunar theory carried out at the Natal Observatory. The method adopted is that developed in the *Memoirs* of the Society for 1879, only substituting numerical values for the algebraical expansion of the different integrating factors. A good deal yet remains to be done to reduce the mass to a form available for printing, as nothing has been done for the last ten years when it was put away until funds were likely to be available for printing.

*Distortion in Photographic Images with the 13-inch Astrographic
Object-glass of the Royal Observatory, Greenwich.*

(Communicated by the Astronomer Royal.)

The measures of the reference stars of the *Eros* photographs have incidentally provided material for a determination of the optical distortion of the object-glass. The reduction of the measures was made in the same way as those for the *Astrographic Catalogue* (*Greenwich Astrographic Catalogue*, vol. i., Introduction, p. xliv), three arbitrary constants being adopted for each plate, viz. two to fix the centre and one for the orientation—the correction for scale value being obtained from the mean of all the photographs, and the corrections for differential refraction and aberration being computed. The differences between the photographic and the assumed positions of the reference stars derived from meridian observations appear as residuals between the standard coordinates computed from the assumed right ascensions and declinations and those obtained from the measures. As the same star frequently occurs on a number of plates, and may be near the centre on some and at some distance from it on others, comparison of the residuals shown at different distances from the centre may be made to determine the distortion of the field, the images within $40'$ of the centre being sensibly unaffected by distortion.

For example, the star B.D. +44°, 326 occurs on photographs obtained on 1900 December 13, 15, and 16. The approximate coordinates and residuals on the several plates are given in the following table :

No. of Plate.	Position of Instrument.	Date.	Approximate Coordinates and Distance from Centre.				Residuals (Tab.-Obs.)	
			x.	y.	r.	$\Delta x.$	$\Delta y.$	
5288	E	Dec. 13 ^{1900.}	-1000	-3100	55	+.05	-.06	
89	E		''	''	''	-.06	-.22	
90	E		''	''	''	-.11	-.15	
94	E		''	''	''	+.13	-.34	
97	E		''	''	''	+.10	+.07	
99	W	Dec. 15	-2400	-200	40	+.16	-.40	
5300	W		''	''	''	-.15	-.36	
04	E		''	''	''	-.06	-.36	
06	E		''	''	''	+.02	-.27	
07	E		''	''	''	-.34	-.28	
08	W	Dec. 16	-3000	+1300	55	-.13	-.42	
						Mean Residuals.		
	Date.		Weight.		x.		y.	
	1900.				''		''	
	Dec. 13		5		+.02		-.14	
	, 15		5		-.07		.33	
	, 16		1		-.13		-.42	